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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/775,908	02/10/2004	Leonard Forbes	400.272US01	1212

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EXAMINER

HO, TU TU V

ART UNIT PAPER NUMBER

2818

DATE MAILED: 05/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/775,908

Applicant(s)

FORBES, LEONARD

Examiner

Tu-Tu Ho

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 April 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4,6,8-10 and 15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,4,6,8-10 and 15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 February 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Applicant's arguments with respect to amended claims 1, 4, 6, 8-10, and 15, filed 04/18/2005, have been considered but they are moot in view of new ground(s) of rejection.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "p+ type silicon material" of **claim 10** must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter that the applicant regards as his invention.

3. **Claim 4** is rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 4 recites “wherein the gate dielectric has a larger energy barrier between the high-k dielectric and the oxide insulator than silicon dioxide” which, in addition to a lack of antecedents, is indefinite. Specifically, what are the functions or the relative positions of the high-k dielectric and the oxide insulator in the claimed NROM device? Exactly what layer or between what layers is the energy barrier higher than silicon dioxide or higher than (between) silicon dioxide and what layer?

Claim Rejections § 102 & § 103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 6, 8-10, and 15 are rejected under 35 U.S.C. 102(b) as anticipated by Haukka et al. U.S. Patent 6,660,660 (the '660 reference), or, in the alternative, under 35 U.S.C. 103(a) as obvious over a prior art device – for example a device disclosed by Hoefler et al. U.S. Patent 6,713,812 (the '812 reference, cited in a previous office action) in view of the '660 reference.

The '660 reference discloses a nanolaminate composite dielectric stack 110 formed by an ALD process ("ALD nanolaminate composite dielectric stack 110") (column 10, lines 42-67) to be used as a gate insulator ("gate dielectric") or memory cell dielectrics (column 5, first paragraph). The reference further teaches that the ALD nanolaminate composite gate insulator comprises ALD Lanthanide Oxide – ALD ZrO_2 – ALD lanthanide Oxide ("Aluminum oxide or lanthanide oxide layers 10, 12 directly contact either side of a dielectric material layer 20.... In the oxide sandwich 15, the middle dielectric layer is preferably characterized by a high dielectric constant (high-k), comprising $ZrO_{2.2}$ ", column 5, lines 5+ and Fig. 1; and note that "ALD" preceding a material is a material layer formed by ALD, for example, "ALD Lanthanide Oxide" is a lanthanide oxide formed by ALD), thereby meeting the limitations of the Markush group of the claimed materials of the claims.

In other words, the '660 reference teaches the claimed nanolaminate gate dielectric or the claimed composite gate insulator layer to be used in a transistor memory element, which element eventually, to be operable, must be used in an electronic system, but fails to disclose other seemingly inherent elements such as a source, a drain, a control gate, a substrate of a p⁺ type silicon material, the substrate having a conductivity type different from that of the source and the drain, a memory array of the memory transistor elements, and a processor coupled to the memory array.

Therefore, if the artisan (i.e., one of ordinary skill in the art at the time the invention was made) realizes that the above-mentioned missing elements are inherent, then the '660 reference anticipates the claims.

In the alternative, the '812 discloses a fully-disclosed transistor memory with a source 52 (Fig. 8), a drain 54, a control gate 34, and a nanolaminate gate dielectric (40/36/38) or a composite gate insulator layer (40/36/38), but fails to teach the materials as claimed for the nanolaminate gate dielectric or the composite gate insulator layer.

The '660 reference, in also disclosing a transistor memory including a nanolaminate gate dielectric or a composite gate insulator layer as detailed above including the claimed materials, teaches that the materials advantageously do not readily react with many other materials and are very good barriers against the diffusion of molecules, atoms and ions.

Therefore, it would have been obvious to one of ordinary skill in the art the time the invention was made to form the '812 reference's nanolaminate gate dielectric (40/36/38) or composite gate insulator layer (40/36/38) using the materials taught by the '660 reference, in

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addition to other advantages such as the ability of the artisan to selectively chose the materials from the known and available materials, for the advantages taught by the '660 reference.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office Action. See MPEP § 706.07(a).

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (571) 272-1778. The examiner can normally be reached on 6:30 am - 5:00 pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID NELMS can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Tu-Tu Ho
May 20, 2005



David Nelms
Supervisory Patent Examiner
Technology Center 2800